Nursing Home Case-Mix Reimbursement in Mississippi and South Dakota

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Objective. To evaluate the effects of nursing home case-mix reimbursement on facility case mix and costs in Mississippi and South Dakota.

Data Sources. Secondary data from resident assessments and Medicaid cost reports from 154 Mississippi and 107 South Dakota nursing facilities in 1992 and 1994, before and after implementation of new case-mix reimbursement systems.

Study Design. The study relied on a two-wave panel design to examine case mix (resident acuity) and direct care costs in 1-year periods before and after implementation of a nursing home case-mix reimbursement system. Cross-lagged regression models were used to assess change in case mix and costs between periods while taking into account facility characteristics.

Data Collection. Facility-level measures were constructed from Medicaid cost reports and Minimum Data Set-Plus assessment records supplied by each state. Resident case mix was based on the RUG-III classification system.

Principal Findings. Facility case-mix scores and direct care costs increased significantly between periods in both states. Changes in facility costs and case mix were significantly related in a positive direction. Medicare utilization and the rate of hospitalizations from the nursing facility also increased significantly between periods, particularly in Mississippi.

Conclusions. The case-mix reimbursement systems appeared to achieve their intended goals: improved access for heavy-care residents and increased direct care expenditures in facilities with higher acuity residents. However, increases in Medicare utilization may have influenced facility case mix or costs, and some facilities may have been unprepared to care for higher acuity residents, as indicated by increased rates of hospitalization.

Key Words. Nursing home, case mix, reimbursement, Medicaid, panel data

Case-mix reimbursement has become a widely adopted method for public financing of nursing facility care. A case-mix approach serves as the basis for the new Medicare Prospective Payment System (PPS) for skilled nursing facilities. This approach is also being used increasingly by states for Medicaid reimburse-

ment for nursing facilities. According to Harrington et al. (1999), 26 states employed some form of case-mix reimbursement in 1997. Since the early 1990s, most states moving to a case-mix system have relied on the Resource Utilization Group (RUG-III) classification model (Fries, Schneider, Foley, et al. 1994), which was developed through the Multistate Case-Mix and Quality Demonstration sponsored by the Health Care Financing Administration (HCFA).

Despite the widespread use of case-mix systems, there has been a relatively small amount of recent research into the effects of this reimbursement approach on provider behavior or delivery of care. Most studies were carried out with case-mix systems introduced in the 1980s. These systems employed a variety of case-mix classification models and rate-setting procedures. Also, they were introduced before the implementation of Omnibus Budget Reconciliation Act of 1987 (OBRA 87), which brought about major regulatory changes in the nursing home industry. To our knowledge no published research has examined Medicaid case-mix systems based on the RUG-III or the experience of states participating in HCFA's Multistate Demonstration.

The purpose of our study was to describe the response of providers to the introduction of case-mix reimbursement in two states (Mississippi and South Dakota) that were part of HCFA's Multistate Demonstration. The lead author consulted on the design of these systems, and he was contracted by the states to evaluate their implementation. Both states introduced similar systems in 1993. By comparing the 1-year periods before and after case-mix reimbursement (1992 and 1994), we wanted to determine whether nursing facilities changed their behavior in line with the objectives of the new reimbursement system. Mississippi and South Dakota offer an interesting contrast. Even though both are small, largely rural states, they differ in their regional cultures (upper Midwest versus deep South) and characteristics of their nursing facilities

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(described later here). If the introduction of a case-mix system evoked a similar response from providers in both states, even with their differences in facility characteristics, then this offers evidence for the generalization of findings.

The new case-mix reimbursement systems in Mississippi and South Dakota were intended to address problems inherent in conventional reimbursement. Conventional systems set facility-specific, prospective rates that are based on historical costs and are subject to a cost limit. They do not take resident acuity into account when setting rates. A facility that admits high-acuity residents and incurs correspondingly high-care costs is likely to be above the reimbursement limit and may face operating losses. Thus, providers are discouraged from admitting heavy-care Medicaid residents, and if they do, the reimbursement system is unlikely to compensate them for the full cost of care. In addition, if providers selectively admit light-care residents in order to hold down direct-care expenditures, these residents are less likely to receive community-based care even though it may be more appropriate and less costly to the Medicaid program.

Case-mix reimbursement has the potential to address these problems in at least two ways. First, it should encourage access to nursing home care while discouraging inappropriate placements. By adjusting Medicaid per diem payments according to resident acuity, case-mix reimbursement should compensate providers for the cost of admitting heavy care residents and discourage them from selectively admitting light-care residents. Second, this approach should lead to more equitable and efficient allocation of Medicaid funds. Providers taking care of similar types of residents should receive similar Medicaid payment rates. High-cost providers serving low-acuity residents should be encouraged to reduce expenditures, and providers caring for high-acuity residents should be reimbursed at a level consistent with their high cost of care. In our study, we wanted to determine whether new systems in Mississippi and South Dakota met the main goals of case-mix reimbursement. First, did facilities increase access for heavy care residents? Second, did they modify direct care expenditures to achieve greater congruence between cost of care and resident acuity?

Earlier studies looking at effects of case-mix reimbursement have arrived at mixed results. Butler and Schlenker (1989), Weissert and Musliner (1992), and others (Feder and Scanlon 1989; Thorpe, Gertler, and Goldman 1991) studied experience of states adopting nursing home case-mix reimbursement during the 1980s. Most studies suggested that case-mix reimbursement improved access for heavy-care residents, with increases in resident acuity and higher percentages of heavy-care Medicaid residents.

However, Davis, Freeman, and Kirby (1998) reported a decline in the average facility case-mix score after the introduction of case-mix reimbursement in Kentucky. Nyman and Connor (1994) found evidence for differential admissions of residents in case-mix groups that were more profitable or received high payments in relation to the cost of care. Also, findings regarding resident acuity must be qualified because of potential problems with validity of case-mix data (Butler and Schlenker 1989; Weissert and Musliner 1992). With a change to case-mix reimbursement, facilities may have attempted to manipulate resident assessment items or ''chart for dollars'' in order to maximize reimbursement.

Studies of facility cost behavior and case mix also have been inconclusive. Schlenker (1991) surveyed for-profit facilities in several states and found a stronger correlation between case mix and direct care costs in states that had case-mix reimbursement than in states with conventional systems. In their Kentucky study, however, Davis, Freeman, and Kirby (1998) reported a positive relationship between case mix and resident-care expenditures before case-mix reimbursement and a negative relationship after the new reimbursement system. Facilities seemed to have engaged in a strategy of cost minimization and profit seeking in response to the new system.

Several studies suggest the need to consider provider characteristics when assessing the impact of case-mix reimbursement. When case-mix reimbursement was introduced in Maryland, for example, Feder and Scanlon (1989) found that for-profit facilities and those with a higher percentage of Medicaid residents had the largest increase in resident acuity. In New York, Thorpe, Gertler, and Goldman (1991) reported that skilled-care facilities had a greater increase in case mix than intermediate-care facilities. They also found that for-profit facilities and those with a higher percentage of Medicaid residents had lower cost growth. Additional studies have inquired into the relationship between provider characteristics, case mix, and costs in states without case-mix reimbursement. Bishop and Dubay (1991) found that access for heavy care residents was associated with a higher percentage of Medicare residents, particularly among for-profit, hospital-based, and larger facilities. Other studies reported that hospital-based, non-profit, or individually owned facilities had higher case-mix-adjusted costs than freestanding, for-profit, or chain facilities (Holmes, 1996; McKay 1991; Schlenker and Shaughnessy 1984). In addition, some studies suggest that market concentration may play a role in the relationship between case mix and costs (Bishop 1988; Davis 1993; Nyman 1988; Scanlon 1980). Facilities with monopolies in local markets might ''pick

and choose'' their admissions and show preference for private pay or lighter-care Medicaid residents.

Mississippi and South Dakota Reimbursement Systems

Mississippi and South Dakota undertook case-mix reimbursement with similar goals in mind. State policymakers wanted to encourage access to care for heavy-care residents, discourage use of nursing homes by light-care residents who might receive more appropriate placement in the community, increase direct care expenditures as a proportion of total nursing home expenditures, and achieve greater equity and efficiency in allocation of Medicaid funds among nursing home providers.

Prior to 1993, both Mississippi and South Dakota had conventional Medicaid reimbursement systems with a prospective, facility-specific per diem rate set according to the facility's prior year costs. Per diem costs incurred in a cost-reporting year were adjusted for inflation and then subject to a limit based on percentile rank. New case-mix reimbursement systems were introduced in both states in 1993. The states retained cost-based, facility-specific, prospective rate-setting methods. However, direct-care costs were adjusted for resident acuity or average facility case-mix score during the cost-reporting period. Payment limits for direct care were established according to a ranking of facilities by case mix-adjusted costs. Facilities with case-mix-adjusted costs above the limit received the limit, and those below the limit were assigned a rate equal to their costs. Rates for other operating costs and capital were set without regard to case mix.

Both states classified residents with the Medicaid version of the RUG-III and the Minimum Data Set-Plus (MDS+) assessment. A resident's RUG-III classification could change at any point during his or her stay, although most residents were classified initially through an admission assessment and were then reclassified, if necessary, through assessments every 90 days thereafter. Residents also could be reclassified if they had a significant change in health status (significant change assessment) or if they were discharged and readmitted to the facility (readmission assessment).

Even though the states adopted a similar reimbursement system design, they differed in two important respects. Mississippi based Medicaid payment on average facility case mix for the entire facility population (Medicaid, Medicare, private pay, or other pay sources), whereas South Dakota based payment solely on case mix of Medicaid residents. Therefore, Mississippi facilities were able to increase their case-mix scores and, in turn, increase their payment rate for

Medicaid residents by admitting heavy-care residents with Medicare or other payment sources. In contrast, the admission of heavy-care Medicare or other residents had no direct effect on the Medicaid payment rate in South Dakota, although it may have indirectly affected payments if the Medicare resident, once admitted, were to convert to Medicaid. The states also differed in their reimbursement incentives. Mississippi introduced a series of ''access and quality incentives'' in which facilities received a 2 percent bonus for residents falling into high-acuity RUG-III groups. Because the incentive payment was over and above the projected cost of caring for the resident, facilities were encouraged to admit residents in RUG-III groups that were covered by the incentive payment. South Dakota facilities had no such incentive; their payment was based simply on the projected cost of caring for the resident.

Study Hypotheses

The main objective of the study was to determine whether providers in the two states changed their case mix and cost behavior between periods before and after introduction of case-mix reimbursement. Study hypotheses were derived from the objectives of the reimbursement systems and our expectations about ways in which facilities would respond to reimbursement change.

1. Measures of facility case mix would increase between periods. Facilities would have an increase in average annual case-mix score and percentage of heavy-care residents and a decrease in the percentage of light-care residents.
2. Facilities would increase their direct-care expenditures between periods, both in absolute terms and as a percentage of total expenditures.
3. When controlling for facility characteristics, there would be a significant positive relationship between case-mix score and direct-care costs in 1994; the two variables may or may not be significantly related in 1992.
4. There would be a convergence between facility case-mix score and direct-care expenditures. Change in facility case mix would have direct positive relationship to change in expenditures, and expenditure change would have a direct positive relationship to case-mix change.
5. Changes in case mix and expenditures would be consistent across states, and these changes would be independent of facility characteristics and the level of resident acuity or direct-care costs in the initial period.

6. Because of differences in system design, Mississippi facilities would be more likely than South Dakota facilities to increase their case-mix scores and to admit heavy-care Medicare residents.

METHODS

The study relied on a two-wave panel design with measurement of facility characteristics, case mix, and costs in calendar years 1992 and 1994. The case mix system was introduced in July 1993 in each state; thus, our data excluded 6-month periods immediately prior to and after introduction of the new reimbursement system. Providers in both states were aware in 1992 that they might have new reimbursement systems; however, the new systems did not take shape until late 1992, and they were not finalized until spring 1993. The analysis data set consisted of 154 facilities from Mississippi and 107 facilities from South Dakota. These facilities represent almost all Medicaid-certified nursing facilities in each state. Three facilities were excluded from the Mississippi and four from South Dakota because of incomplete information. Cost figures and facility characteristics were taken from Medicaid cost reports and supporting information supplied by the Mississippi and South Dakota Medicaid programs. Facility level case mix and utilization variables were constructed from resident MDS+ assessments made available by the states. The MDS+ is an enhanced version of the MDS. Development of the MDS, assessment procedures, and reliability of items are reported elsewhere (Fredericksen, Tariot, and De Jonghe 1996; Hawes, Morris, Phillips, et al. 1995).

Study Variables

All study variables were measured at the facility level. Facility characteristics were bed size, location (urban or rural), ownership (for-profit or non-profit/governmental), chain affiliation, and hospital affiliation. Market concentration was measured with a Herfindahl Index (range of 0 to 1) by taking the facility's percentage of total beds in each county or metropolitan statistical area (MSA), squaring this percentage, and then summing across facilities in the county/MSA (Zinn 1994). Occupancy rate was not included in the analysis because rates were very high in both states and they displayed little interfacility variation.

Resident acuity was measured through a summary case-mix score calculated from the weighted average of annual resident days in each case-mix group. We also calculated percentage of residents falling into each major case-mix category during the year. The case-mix categories form a hierarchy

representing resident acuity or use of special services, including therapies. At the highest level are residents in the special extensive care category (e.g., ventilator/respirator, tracheotomy care, suctioning, and parenteral/intravenous feeding), followed by rehabilitation (use of licensed therapies), special care (e.g., coma, quadriplegia, stages III and IV pressure sores, burns, septicemia, and related conditions), clinically complex (e.g., hemiplegia, stasis ulcer, surgical wounds, aphasia, terminal illness, and others), impaired cognition (memory loss and impaired decision making among residents with low activities-of-daily-living [ADL] impairment), behavioral problems (daily behavior that is violent or disruptive among residents with low ADL impairment), and physical reduced function (residual category indicating absence of conditions associated with other categories in the hierarchy). In addition, we measured the percentage of residents falling into the lowest acuity RUG-III group. These were residents in the physical category that had very low ADL impairment and, perhaps, did not need the services of a nursing facility.

Utilization variables consisted of percentage of annual resident days and rate of admissions with Medicare, Medicaid, or other pay sources (private pay, VA, or private insurance) as the primary method of payment. Primary pay source was defined as the source covering the nursing facility per diem. Residents who were dually eligible for Medicaid and Medicare were assigned a pay source according to the program covering their per diem payment, even if they were receiving ancillary services from another pay source. Another utilization variable was rate of hospital-related readmissions for residents who left the nursing facility, were admitted to the hospital, and then were readmitted to the nursing facility. We used the term *hospitalizations* to refer to this variable. Finally, we constructed per diem cost variables by dividing the facility's total costs by its total resident days during the year. Costs were divided into three categories: direct care, administration and other operating, and capital. Direct-care costs included nursing salaries and benefits, direct-care supply costs, and costs for specialized services such as parenteral feedings.

State Characteristics

Mississippi and South Dakota are small, largely rural states. Among states in 1992, South Dakota ranked twenty-second and Mississippi thirty-third in the number of nursing home beds per 1,000 persons age 85 or older (Kane, Kane, and Ladd 1998). Both states had high nursing home occupancy rates at 94 to 95 percent. However, Mississippi ranked third in percentage of nursing home residents on Medicaid (83 percent), whereas South Dakota ranked 46th

Table 1: Characteristics of Mississippi and South Dakota Nursing Facilities

	Mississippi	*South Dakota*
Number of Beds		
< 50	8.4%	29.9%***
50–99	42.9	59.8
100–150	40.9	5.6
> 150	7.8	4.7
Mean bed size	103.8	71.7***
Rural location	81.3%	85.6%
Ownership		
For-profit	79.4%	35.1%***
Nonprofit/governmental	20.6	64.9
Chain affiliation	50.7%	50.5%
Hospital affiliation	15.5%	18.0%
Mean market concentration	0.492	0.531
Above cost ceiling in 1992	32.9%	21.6%*

*$p < 0.05$; ***$p < 0.001$.

(55 percent). Both states had heavy reliance on nursing homes for long-term care. They ranked in the top 10 among states in federal, state, and local spending on nursing homes as ratio to spending on home and community-based care (Kane, Kane, and Ladd 1998). Table 1 shows characteristics of nursing facilities in Mississippi and South Dakota. Facilities in both states were predominately rural (non-MSA location); approximately half of the facilities in each state were chain affiliated, and a minority were hospital affiliated. South Dakota had significantly more small facilities (< 50 beds) and significantly more nonprofit facilities.

Analysis

The first objective of our analysis was to describe changes in case mix, cost, and utilization between 1992 and 1994. We set up a series of paired comparisons with measures of each variable in 1992 and 1994. One-way analysis of variance, paired comparison *t* tests, and chi-square tests were employed to determine significance of change in individual variables. Our second objective was to examine the relationship between case mix, direct care costs, and facility characteristics in 1992 and 1994. For these analyses, we set up separate regression equations for the two periods with case mix and costs regressed on each other and facility characteristic variables. Our final objectives was to examine the relationship between case-mix change and change in direct care costs between periods when controlling for facility characteristics and

utilization patterns. We assumed providers would respond to the new reimbursement system by changing their case mix and expenditure patterns, and changes in one area would likely influence changes in the other. Also, we constructed regression equations separately for the states because we wanted to test by state for differences in the effects of reimbursement system design and facility characteristics. Treating a state as a dummy variable in a single equation would have made it difficult to specify interactions between state and other variables.

To examine reciprocal effects between case mix and costs, we constructed discrete-time, cross-lagged, conditional change regression models (Finkel 1995). The cross-lagged specification required two regression models. We regressed 1994 case-mix score on 1992 case-mix score, 1992 direct-care costs, change in direct-care costs 1992–1994, and other variables. In a second equation, we regressed 1994 direct-care costs on 1992 direct-care costs, 1992 case mix, change in case mix 1992–1994, and other variables. This formulation allows us to address two questions. First, was there a significant reciprocal relationship between changes in case mix and direct-care cost between periods? Second, did facility characteristics or utilization patterns influence change in case mix or costs?[1]

RESULTS

The first stage of analysis was to compare case mix, cost, and utilization variables for each state before and after reimbursement change (Table 2). The average resident acuity in Mississippi was higher than that of South Dakota in 1992 and 1994. However, both states experienced a significant increase in resident acuity between periods. Average case-mix scores increased by approximately 3 percent, and the percentages of residents in higher RUG-III categories (extensive, rehabilitation, and clinically complex) went up significantly, whereas the percentage of residents in the physical category declined significantly. A substantial portion of the percentage decline was among residents in the lowest RUG-III group. This group dropped from 17.3 to 15.1 percent in Mississippi and from 19.6 to 15.3 percent in South Dakota.

Table 2 also shows that per diem costs increased between periods in both states. Direct-care costs as a percentage of total costs rose by a small but statistically significant amount. In addition, the percentage of resident days with Medicare SNF coverage went up by slightly more than 2 percent in both states. Mississippi had a small decline in Medicaid resident days, whereas South

Table 2: Case-mix, Cost, and Utilization in 1992 and 1994

	Mississippi		*South Dakota*		*State Contrasts*	
	1992	*1994*	*1992*	*1994*	*1992*	*1994*
Mean case-mix score	0.999	1.031***	0.970	1.009***	###	##
Major RUG-III category						
Extensive	0.9%	1.5%**	0.6%	0.5%		###
Rehabilitation	1.4	2.5***	1.0	2.0***		
Special care	8.5	9.1	3.7	4.7***	###	###
Clinically complex	14.6	14.1	14.3	11.9***		##
Behavioral problems	1.1	1.0	1.2	1.2		
Physically reduced function	45.7	40.0***	50.0	44.4***	###	###
Lowest RUG-III group	17.3	15.1***	19.6	15.3***		#
Mean reported per diem cost						
Direct care cost	$22.94	$27.65***	$27.30	31.88***	###	###
Other operating cost	28.18	32.57***	33.57	37.02***	###	###
Capital cost	5.92	5.99	4.35	4.71**	###	##
Direct care percent of total	40.2%	41.7%***	41.9%	43.3%***	##	##
Residents by primary pay source						
Medicare	2.4%	4.7%***	2.9%	4.2%***		
Medicaid	79.1	73.1***	54.1	56.2**	###	###
Private pay or other	18.5	22.2	43.0	39.6	###	###
Annual admission rates (/100 facility residents)						
Medicare	6	12***	10	17***	##	##
Medicaid	19	19	9	7	###	###
Private pay or other	20	20	31	31	###	###
Total	45	51	50	55	##	##
Annual hospitalization rates (/100 facility residents)	37	67***	27	39***	###	###

Significance of period contrasts (within states): * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.
Significance of state contrasts (within periods): # $p < 0.05$; ## $p < 0.01$; ### $p < 0.001$.

Dakota had a small increase. Admission rates (number of admissions per 100 annual resident days) increased from a facility mean of 45 of 100, to 51 of 100 in Mississippi, and 50 of 100, to 55 of 100 in South Dakota. All of the Mississippi increase came from a change in Medicare admissions from 6 of 100 to 12 of 100. South Dakota had an increase from 10 of 100 to 17 of 100 in Medicare admissions and a slight decrease in Medicaid admissions. Another measure of utilization is the rate of hospitalizations, that is, when a resident enters the hospital and returns to the nursing facility. There was a substantial increase in hospitalizations for Mississippi—from 37 of 100 to 67 of 100. South Dakota displayed a less dramatic but significant increase.

In the next stage of the analysis, we constructed case-mix and cost regression equations for each state in each period (1992 and 1994). We regressed case mix on cost and cost on case mix, along with facility characteristics and utilization variables. The purpose of the analysis was to see whether case mix and costs would be related to each other in both periods and whether the relationships would be stronger in 1994 than in 1992. Results are not reported in the tables, but they are available from the authors on request. The regressions models for case mix had relatively low adjusted R squares, ranging from 0.143 to 0.274, whereas the models for direct care cost had somewhat higher adjusted R squares, ranging from 0.246 to 0.478. Cost was a significant, positive predictor of facility case mix, and case mix was a significant, positive predictor of costs for each state in each period. Regression coefficients for case mix as a predictor of cost and cost as a predictor of case mix increased

Table 3: Case Mix Change Equations: 1994 Case Mix Score Regressed on 1992 Case-Mix Score and Other Variables

	Mississippi		*South Dakota*	
	b	*Standard Error*	*b*	*Standard Error*
1992 Case mix score	0.578***	0.071	0.411***	0.086
Small facility	−0.002	0.019	0.002	0.009
Urban	0.001	0.013	0.008	0.014
For profit	0.030	0.018	0.010	0.011
Chain affiliated	−0.005	0.011	−0.005	0.009
Hospital affiliated	0.062**	0.020	0.011	0.011
Market concentration	0.005	0.016	−0.018	0.017
Above 1992 ceiling	0.007	0.013	0.006	0.011
1992 Direct care cost	0.001	0.001	0.003**	0.001
1992 Medicaid percentage	0.070	0.045	0.015	0.047
1992 Medicare percentage	0.148	0.197	−0.253	0.192
1992 Medicaid admission rate	−0.033	0.046	0.008	0.099
1992 Medicare admission rate	−0.033	0.069	0.054	0.051
1992 Hospitalization rate	0.029	0.021	−0.002	0.023
Change in direct care cost[a]	0.002*	0.001	0.003*	0.001
Change in Medicaid admission rate	−0.002	0.044	−0.100	0.089
Change in Medicare admission rate	0.084**	0.028	0.017	0.034
Change in hospitalization rate	0.052**	0.017	0.011	0.023
R^2	0.519		0.507	
Adjusted R^2	0.454		0.410	
F	7.973***		5.251***	

[a]Change in variable between 1992 and 1994 (1992–1994).
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

significantly between 1992 and 1994 in South Dakota; however, they remained approximately the same in Mississippi. Findings for Mississippi were complicated because Medicare utilization and rate of hospitalizations emerged as strong, positive predictors of case mix and cost in 1994. This stage of the analysis provided evidence for a reciprocal effect between case mix and cost, and it suggested that we take Medicare utilization and hospitalization rate into account when assessing case mix and cost change.

In the final stage of the analysis, we looked at the relationship between case mix and direct care cost change between periods while taking into account facility characteristics and utilization change between periods. Table 3 presents results for the regression model with 1994 case-mix score regressed on 1992 case-mix score, and direct care costs, utilization and facility characteristics in 1992, and changes in these variables between 1992 and 1994. In both Mississippi and South Dakota, the change in direct care costs between 1992 and 1994 was significantly related to change in case mix. Facilities increasing their costs also increased their case mix. In addition, 1992 direct-care cost was significantly related to case-mix change in South Dakota. Facilities with higher costs in 1992 were more likely to experience an increase in case mix between periods. Other variables were also related to case-mix change in Mississippi—hospital-affiliated facilities and facilities that increased their rate of Medicare admissions and their rate of hospitalizations were more likely to have an increase in case mix. In South Dakota, no other variables besides the cost variables were significantly related to case-mix change.

Table 4 shows the results of the regression models where 1994 direct-care cost is regressed on 1992 direct-care cost, facility characteristics, and utilization variables in 1992, and changes in these variables between periods. Change in case-mix score had a significant, positive relationship to change in direct-care costs for both Mississippi and South Dakota. That is, facilities that increased case mix between 1992 and 1994 also increased their direct-care costs. In South Dakota, the facility case mix score in 1992 was significantly related to change in direct care costs: Facilities that had a higher 1992 case mix had a greater increase in costs between periods. Besides case mix, the only variable related to direct care costs change in Mississippi was the 1992 level of other operating costs. Facilities with higher 1992 costs in other operating areas (besides direct care) had a greater increase in direct care costs than facilities reporting lower operating costs. For South Dakota, no other variable besides case mix was related to change in direct care costs.

Table 4: Direct Care Change Equations: 1994 Direct Care Costs Regressed on 1992 Direct Care Costs and Other Variables

	Mississippi		*South Dakota*	
	b	*Standard Error*	*b*	*Standard Error*
1992 Direct care cost	0.801***	0.098	0.980***	0.099
Small facility	−0.612	1.329	0.299	0.730
Urban	0.161	0.896	0.575	1.049
For profit	−0.365	1.291	−1.355	0.770
Chain affiliated	0.530	0.776	0.304	0.656
Hospital affiliated	−2.575	1.436	−1.410	0.808
Market concentration	−0.423	1.137	1.243	1.213
Above 1992 ceiling	−0.732	0.943	−0.279	0.881
1992 Case mix score	1.372	5.551	17.867*	7.441
1992 Operating cost	0.193*	0.078	−0.096	0.083
1992 Capital cost	−0.076	0.113	−0.057	0.127
1992 Medicaid percentage	−0.394	3.169	−0.682	3.417
1992 Medicare percentage	17.495	13.665	14.864	13.946
1992 Medicaid admission rate	−3.069	3.209	−5.219	7.427
1992 Medicare admission rate	1.189	4.833	3.869	3.655
1992 Hospitalization rate	−0.272	1.452	0.942	2.034
Change in case mix score[a]	13.296*	5.941	15.403*	7.419
Change in Medicaid admission rate	−0.188	3.049	6.240	6.567
Change in Medicare admission rate	−0.276	2.002	5.063	2.465
Change in hospitalization rate	−0.773	1.205	1.410	1.655
R^2	0.615		0.832	
Adjusted R^2	0.556		0.795	
F	10.456***		22.322***	

[a]Change in variable between 1992 and 1994 (1992–1994).
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

DISCUSSION

This study's results support our hypotheses about provider response to nursing home case-mix reimbursement. First, Mississippi and South Dakota seemed to have achieved greater nursing home access for high-acuity residents. The average facility case-mix score rose significantly in each state, and the states experienced an increase in the percentage of residents in heavier care RUG-III groups. Conversely, there was a decline in the percentage of residents in the lightest care groups or those persons who may have been inappropriately placed in nursing homes and could benefit from community alternatives. Second, case-mix change was accompanied by increases in direct-care

expenditures, in absolute terms and as a percentage of overall expenditures. Third, we found a significant positive relationship between case mix and costs in each period (1992 and 1994). Fourth, we found evidence for a convergence of case mix and costs. Providers that increased facility case mix between periods were significantly more likely to increase direct-care costs and vice versa. Changes in case mix and expenditures were consistent across different types of facilities in each state. For the most part, facility characteristics, such as ownership type, facility size, hospital or chain affiliation, percentage Medicaid, or market concentration, were not significantly associated with case mix or cost change between periods.

Finally, differences in reimbursement system design seemed to have affected providers in the two states; however, results were not conclusive. For example, Mississippi's profit incentives for heavy-care residents may have been a factor in increased case-mix scores; Yet South Dakota facilities, where facilities did not have an incentive, also experienced a significant increase in average case-mix scores. Facilities in both states had an increase in Medicare utilization between periods; however, only in Mississippi did changes in Medicare admissions have a significant effect on case-mix change. Mississippi providers seemed to have responded to that state's incentive for admitting heavy-care Medicare residents.

A troubling finding from the study was the increase in the rate of hospitalizations in both states. The increase in Mississippi was greater than South Dakota's, and it was a significant, independent factor in accounting for case-mix change. This movement between nursing home and hospital might simply be an indicator of medical instability associated with more complex cases being admitted initially to the nursing home, or it could be evidence that the facilities were unprepared to care for residents with more complex health care needs. Evidence from the analysis suggests care quality may have been a factor in Mississippi's high rate of hospitalizations. When controlling for case mix and other variables, Mississippi facilities with lower direct care expenditures had more residents moving back and forth to hospitals. Another explanation for high rates of hospitalizations relates to the way case-mix scores were calculated with the RUG-III. Services received in the hospital, such as intravenous medications, could be counted toward the case mix score on the nursing home admission assessment even if these services were not provided for in the nursing home. As a result, providers may have had an incentive to rehospitalize the resident in order to take advantage of higher reimbursement when the resident returned to the facility. We should note that Mississippi changed its case-mix scoring system in 1995 to disallow nursing home reimbursement for services

received in the hospital but not provided for in the nursing facility. This policy change was introduced, at least in part, to discourage inappropriate hospital admissions from nursing facilities.

These findings offer support for study hypotheses. Nonetheless, they need to be qualified in several respects. First, increases in facility case mix between periods may have resulted in part from providers' attempts to game the system or ''chart for dollars'' (Butler and Schlenker 1989; Weissert and Musliner 1992); providers may have changed their assessment methods in order to maximize reimbursement. We should point out that both states conducted on-site audits of MDS data during both study periods. Audit teams would correct assessments and recalculate case-mix scores if they found data inaccuracies or evidence of gaming. Although these procedures cannot guarantee accuracy or validity of assessment data they probably kept these problems to a minimum.

Second, the study relied on a simple, before/after design in which outside influences, other than the change in reimbursement, may have affected provider behavior. One such influence was the increase in Medicare participation. We took Medicare into account indirectly by including the rate of Medicare admissions as an independent variable in the regression models. However, other factors not measured in the study may have confounded or biased the results. Third, we did not have data to corroborate the impact of the new reimbursement system on access to care. We were not able to determine, for example, whether the length of hospital stays, or other measures of postacute utilization, declined as nursing home case mix increased, nor were we able to track community placements to see whether lighter care residents were being diverted to home- and community-based care. We know that South Dakota was in the process of expanding residential care (assisted living) and community-based services during this period, but we do not know what impact this might have had on nursing home utilization.

Finally, the study did not directly address the issue of care quality, which has been an area of debate in case-mix systems (Fries and Ikegami 1994; Kane 1994). Indirectly, we looked at the association between direct care expenditures and case mix. Direct-care expenditures might serve as a proxy for the number and skill level of staff, and staffing could, in turn, be an indicator of care quality. However, the relationship between staffing and quality may be tenuous, as many factors besides staffing level affect care quality. We also have suggested that hospitalizations from the nursing home may be an indicator of care problems. Hospitalizations may have resulted from acute episodes or exacerbations of chronic conditions that nursing facility staff were unable to handle.

The study could have benefited from better measures of quality, particularly evidence regarding processes or outcomes of care.

Despite these qualifications, the study suggests that case-mix reimbursement can influence provider's admitting practices and direct-care expenditure patterns in line with state policy goals. Moreover, effects of case-mix reimbursement can be generalized across states with different cultural characteristics and provider makeup. Finally, findings point to the need for additional research. We need up-to-date research of the impact of case-mix reimbursement in states that have used case mix for several years, such as Mississippi and South Dakota, as well as in states that are currently introducing these systems. At the national level, it would be advisable to evaluate effects of the Medicare PPS for nursing facilities. Little, if any, research has been conducted on the effects of pricing models, such as Medicare PPS, versus cost-based models used by most Medicaid programs. Also, studies should examine the interrelationship between access, cost, and quality of care. The development of state and national data repositories for MDS assessments opens new possibilities for multistate comparisons. These studies should better inform policymakers about reimbursement system design and its impact on resident care.

NOTE

1. As Finkel (1995) pointed out, the conditional change approach is superior to the ''unconditional'' change score method (method of first differences) because it recognizes that initial scores for an endogenous variable (case mix or cost) may influence change in that variable between periods. For example, a facility with high initial costs may be less likely to increase its costs between periods than a facility with low initial cost, or vice versa. Also, the conditional change method takes into account problems of estimation owing to regression toward the mean or negative correlation between a variable's initial scores and its change between periods. The cross-lagged formulation allows us to test reciprocal effects by including the lagged score for each endogenous variable (case mix or cost) in the change equation for the other endogenous variable. For example, we can infer reciprocal causation between case mix and cost if time 1 cost has a significant effect (regression coefficient) on case-mix change and time 1 case mix has a significant effect on cost change. We decided against a more complicated modeling approach, such as two-stage least-squares or a structural equation model; it is more difficult to assess the fit of these models, and we could not identify an appropriate instrumental variable.

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